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(71) Applicant(s)
Muhammad Yousuf Khalid
87 Romilly Road, Canton, CARDIFF, CF5 1FN,
United Kingdom

(72) Inventor(s)
Muhammad Yousuf Khalid

(74) Agent and/or Address for Service
Muhammad Yousuf Khalid
87 Romilly Road, Canton, CARDIFF, CF5 1FN,
United Kingdom

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GB 1524882 A WO 98/06933 A1 US 4683852 A

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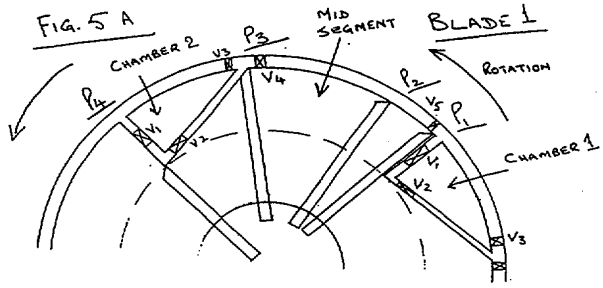
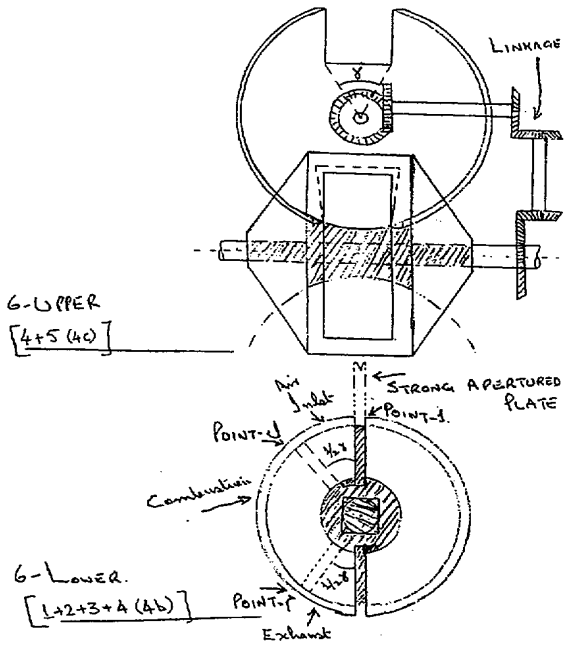
(54) Abstract Title
**Internal combustion rotary engine**

(57) An internal combustion rotary engine comprises a casing, and a rotary drive shaft concentric with the casing and carrying a hub and fixed blades in air-tight contact with the casing, the segment of the casing swept by the blades being used, by means of a movable barrier, to create an ignition/compression chamber. The power generated is applied directly to the blades. The barrier, in form of a rotating apertured plate (Fig.6), or axially or radially sliding, or pivoted plate, moves in a slot cut into the casing in synchronism with the shaft to let the blades rotate unhindered.

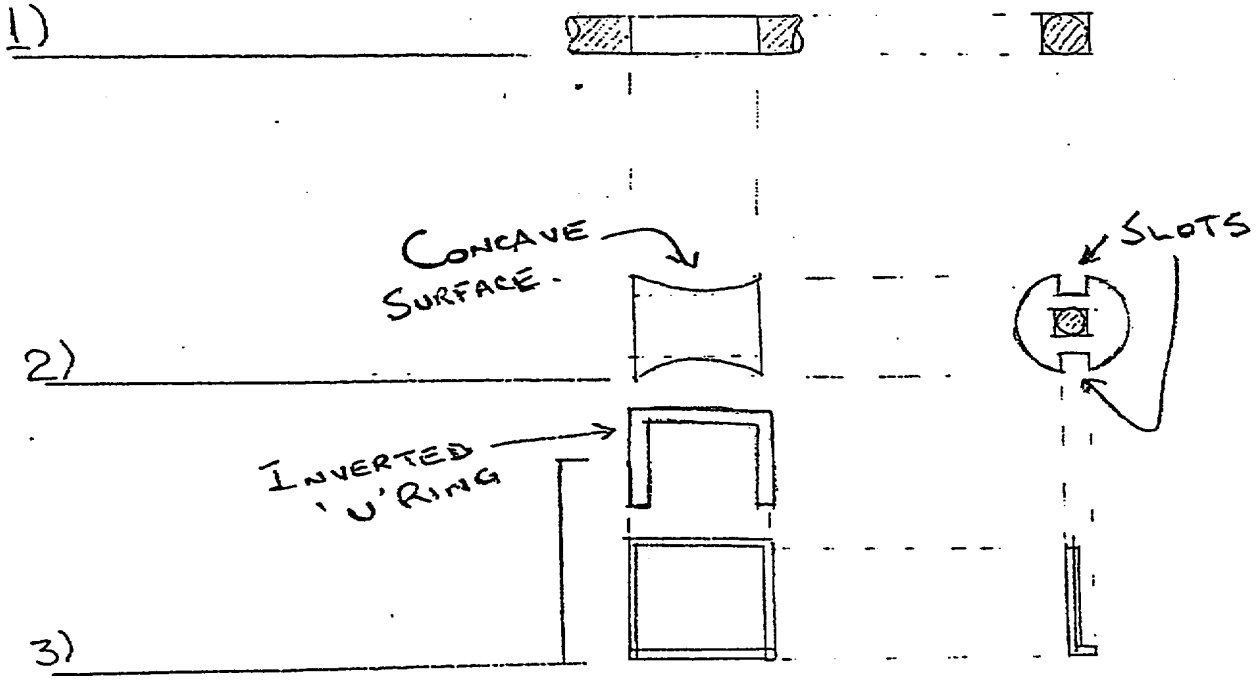
In alternative embodiments, a barrier (Fig.5A) is built within the segment of casing swept by retractable blades, a compression chamber may be built within this barrier and/or the casing adjacent to it and/or the blades, or the blades are fixed to the hub while the casing accommodates a movable barrier.



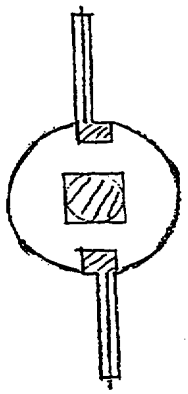




GB 2 356 896 A

1/12 EXAMPLE 1

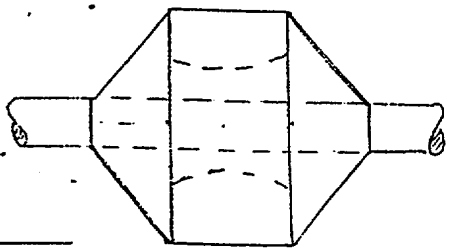



1 + 2 + 3

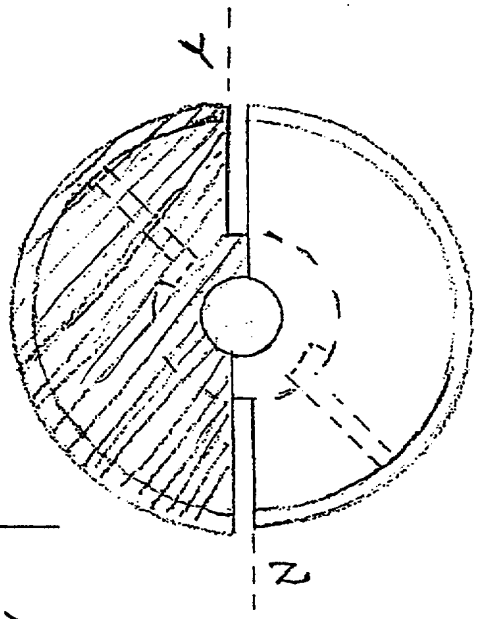


EXAMPLE 1

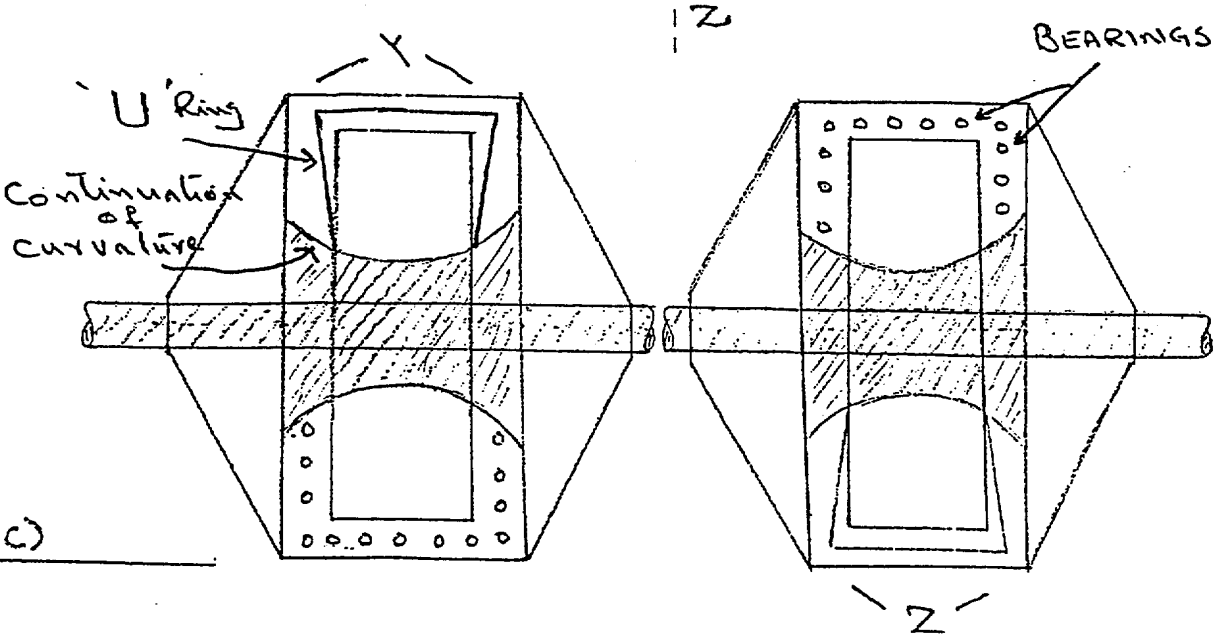
4 a)



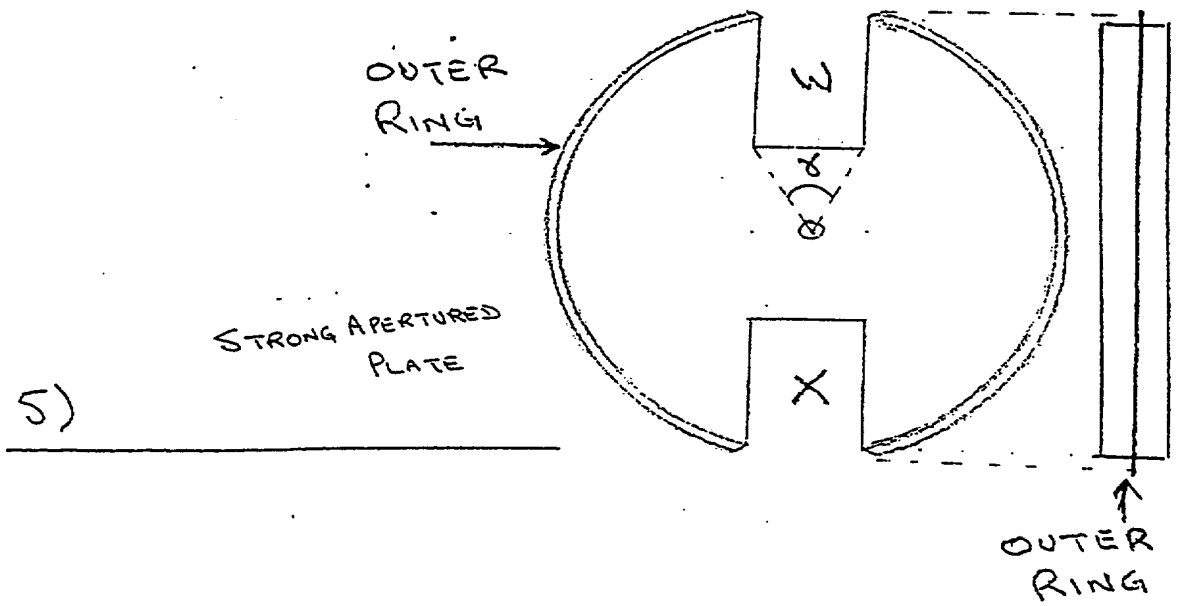
4b)




4c)



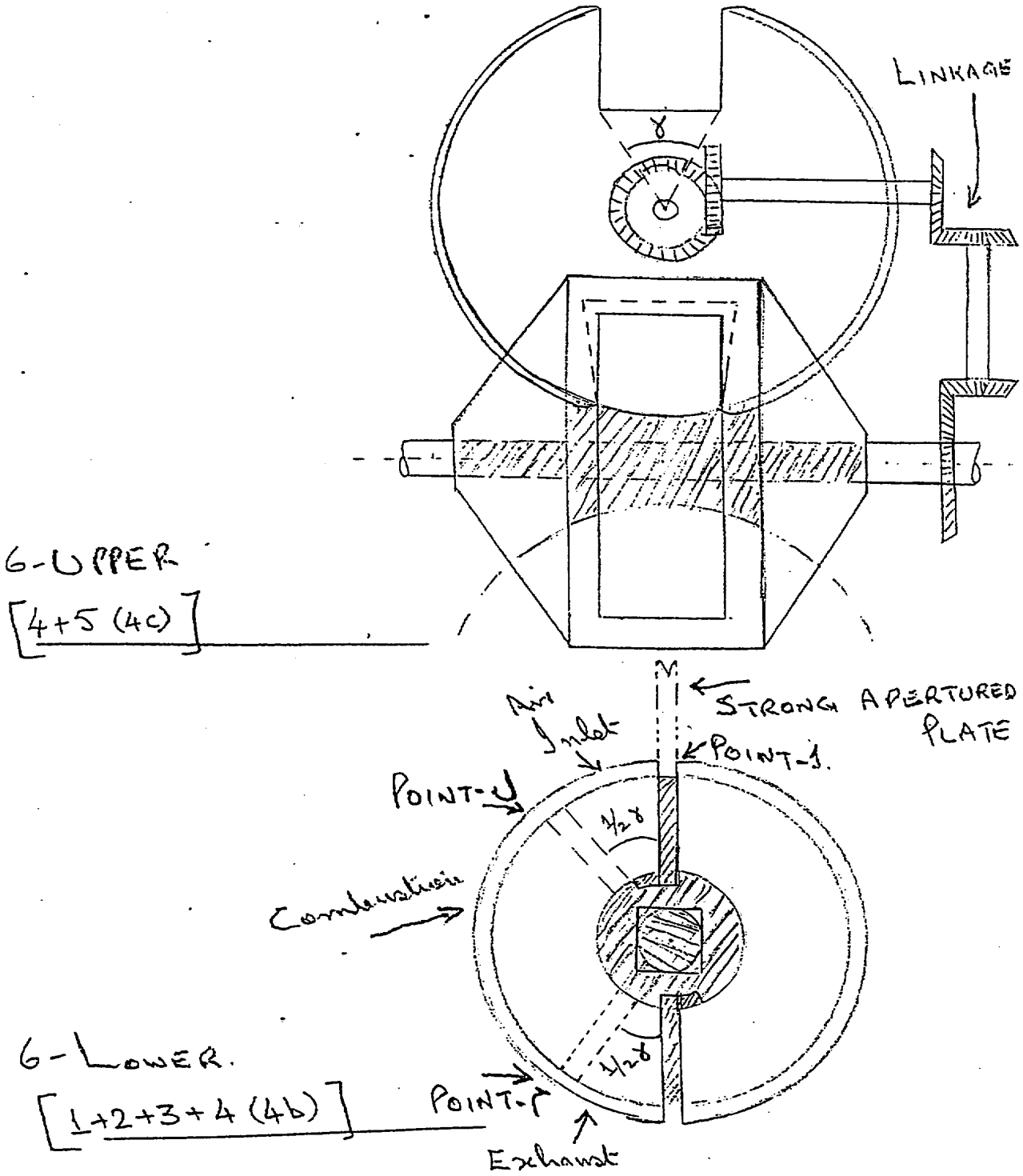
EXAMPLE 1




STRONG APERTURED PLATE

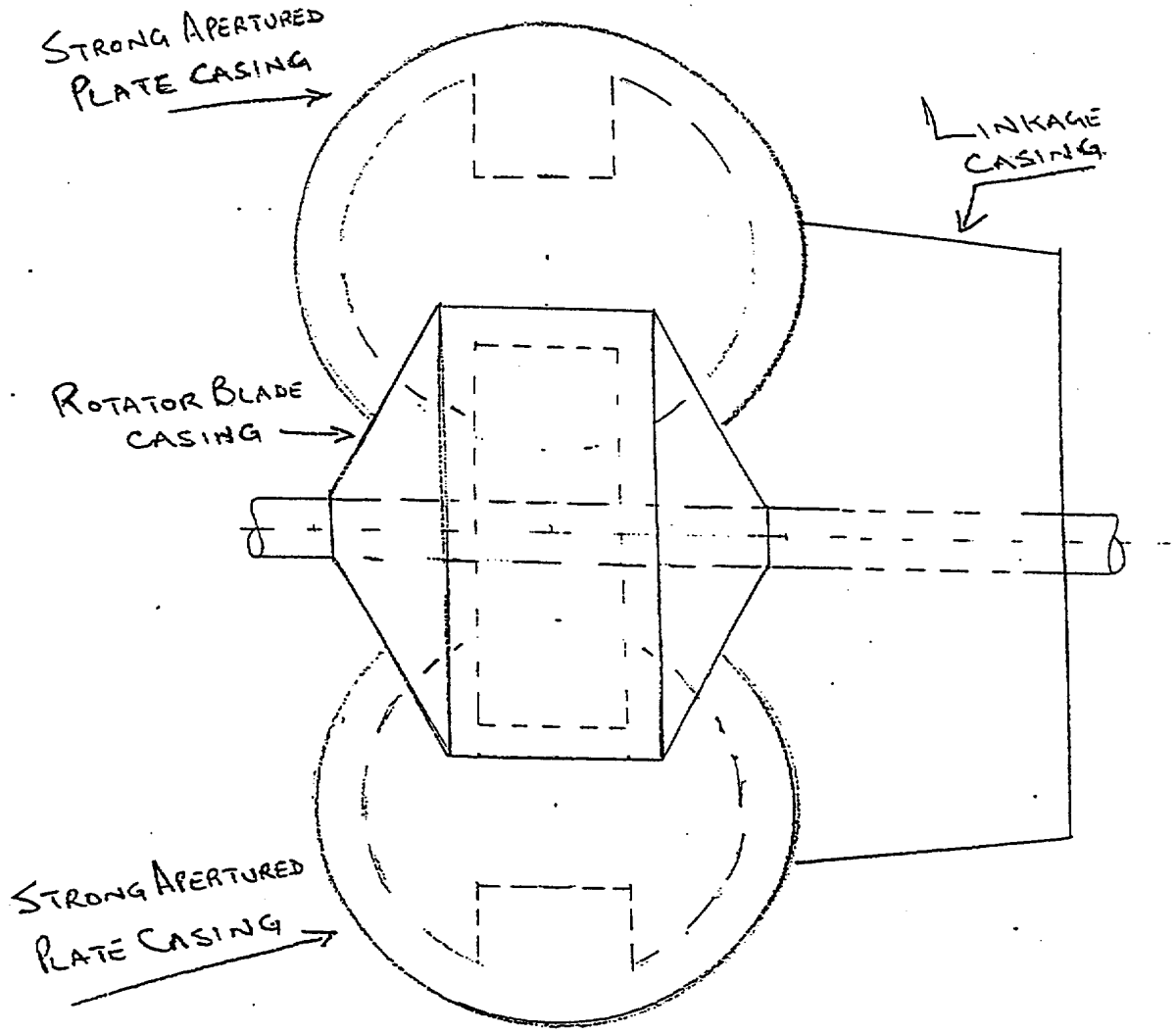
5)

·EXAMPLE 1


LINKAGE
γ
6-UPPER
[4+5 (4c)]
STRONG APERTURED PLATE
Air Inlet
POINT-1
POINT-2
½ γ
Combustion
6-LOWER.
[1+2+3+4 (4b)]
POINT-3
½ α
Exhaust

EXAMPLE 1

7- FINALLY ALL PARTS ASSEMBLED AND ENCASED



EXAMPLE 2

FIG. 1A

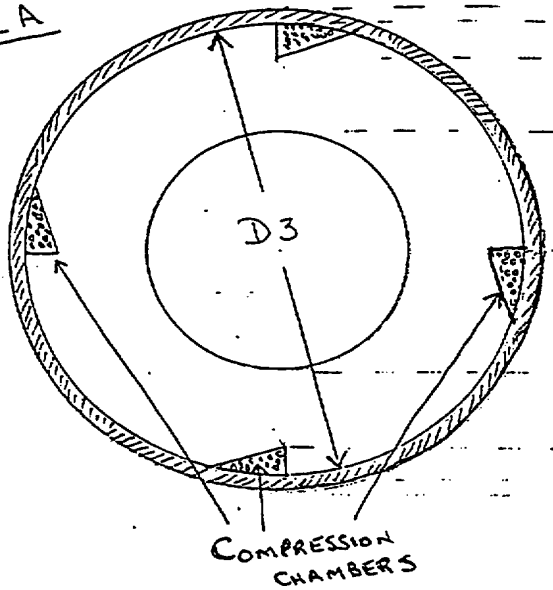



FIG 1B

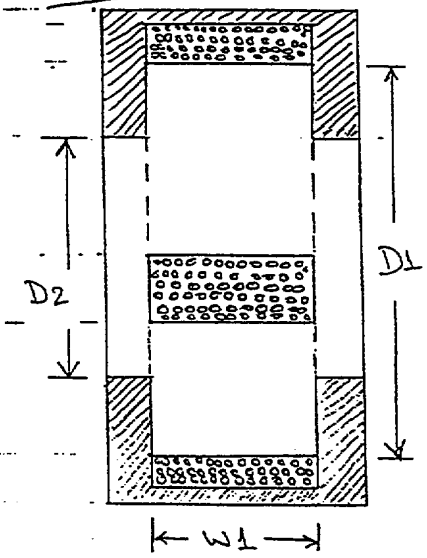
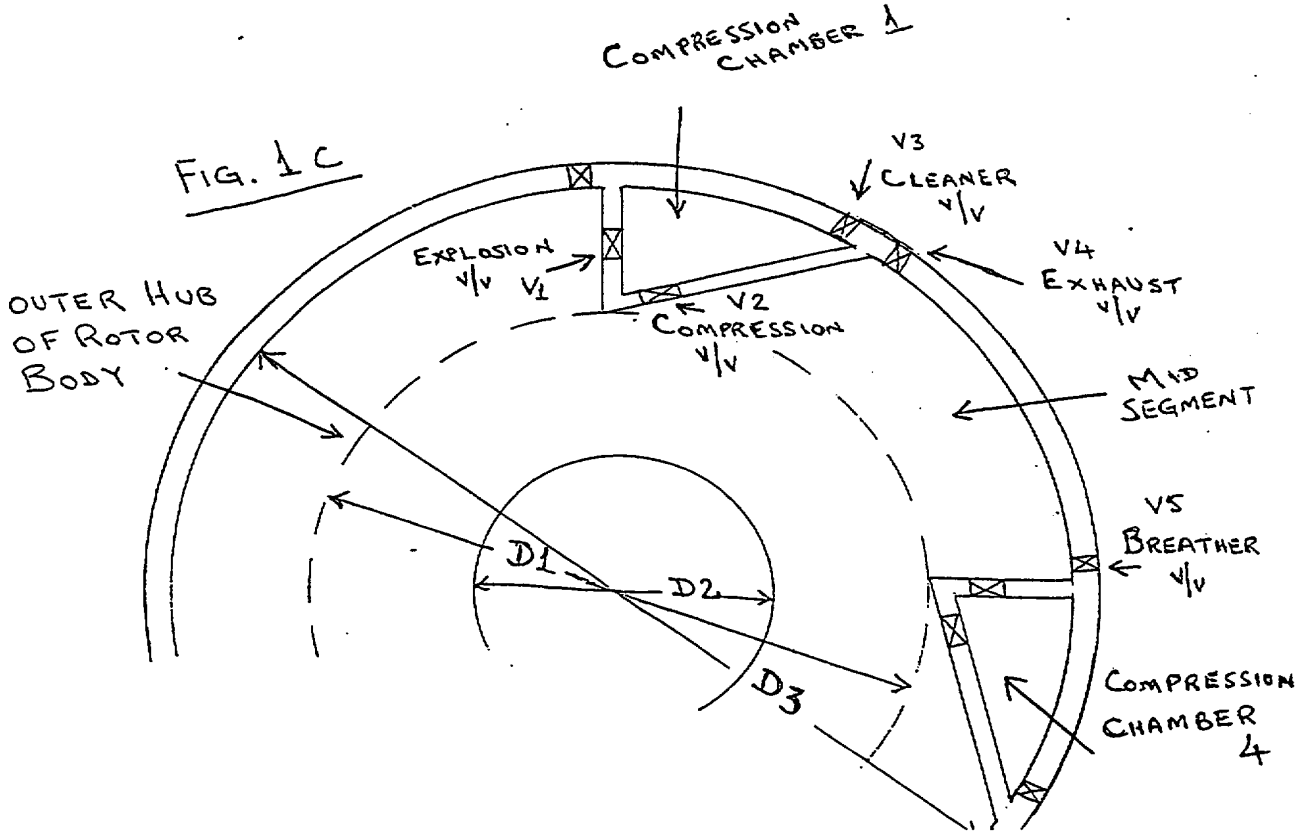



FIG. 1C



EXAMPLE2

FIG. 2

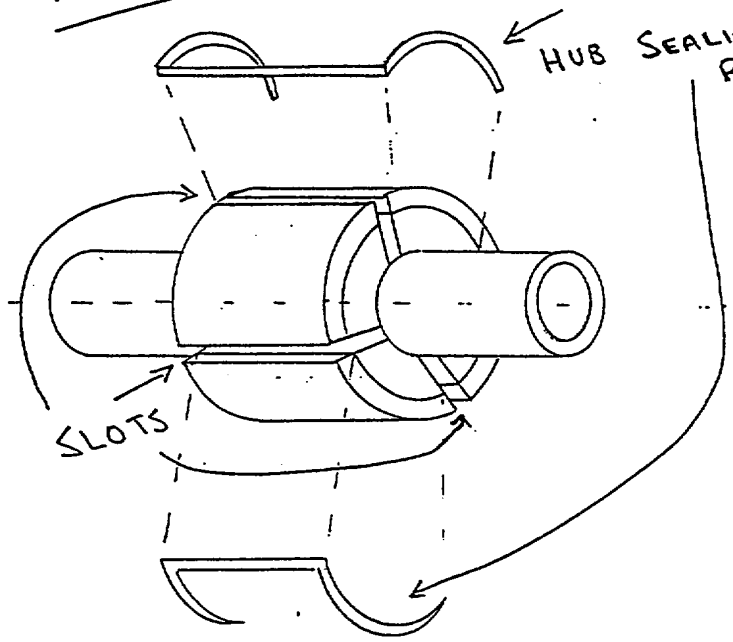
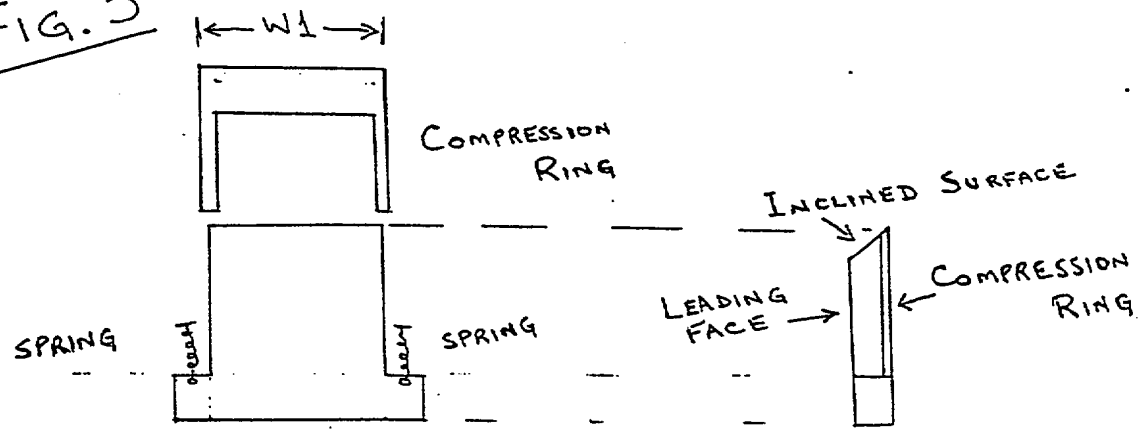



FIG. 3



EXAMPLE 2

FIG. 4A

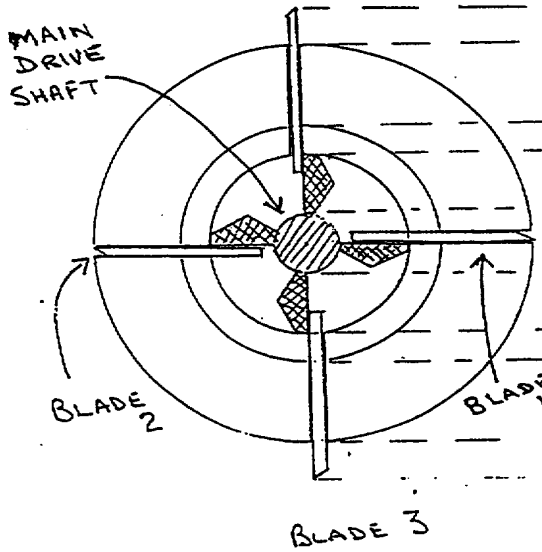



FIG. 4B

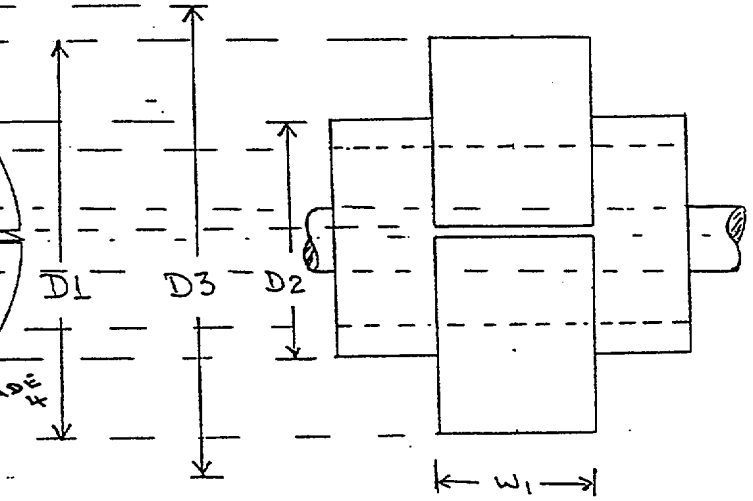
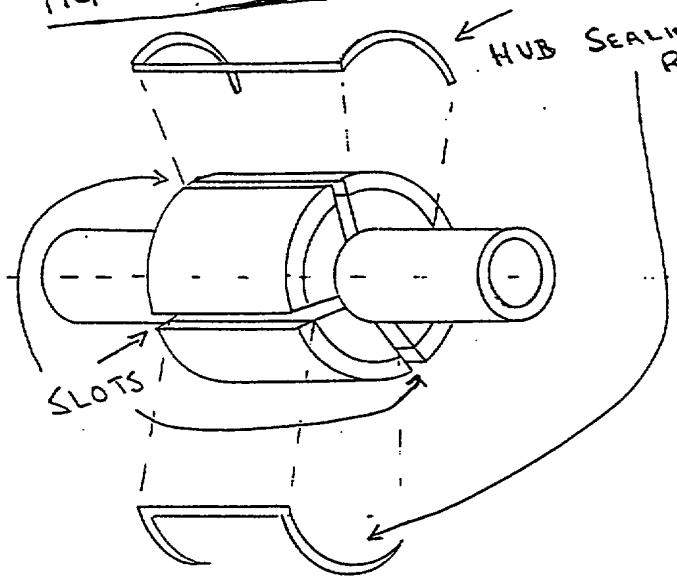



FIG. 2 - REPEATED




ROTOR BODY

EXAMPLE 2

FIG. 5 A

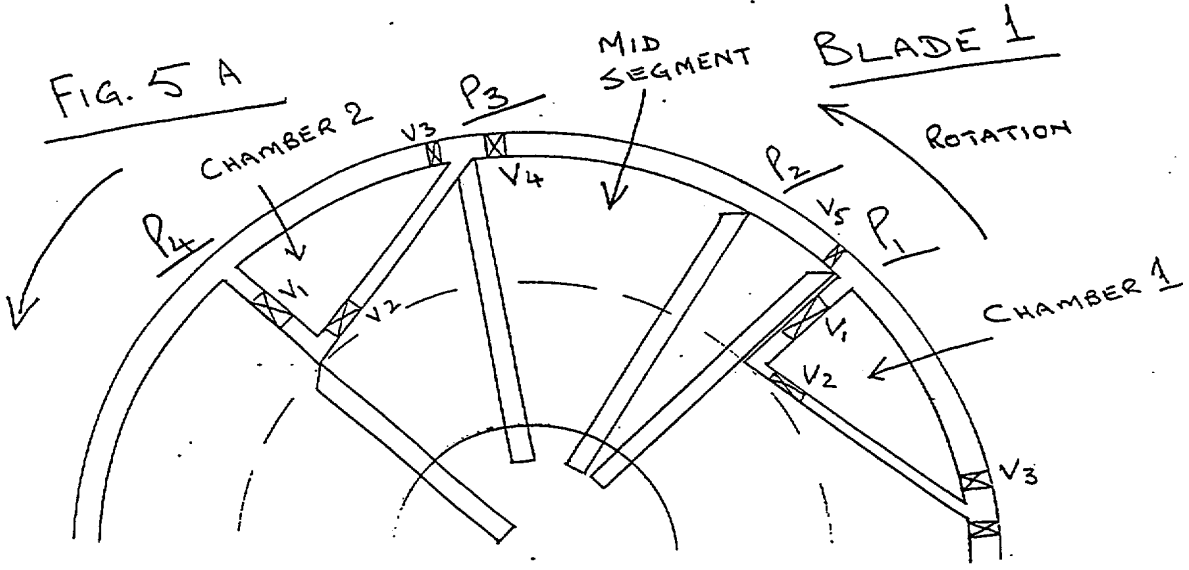
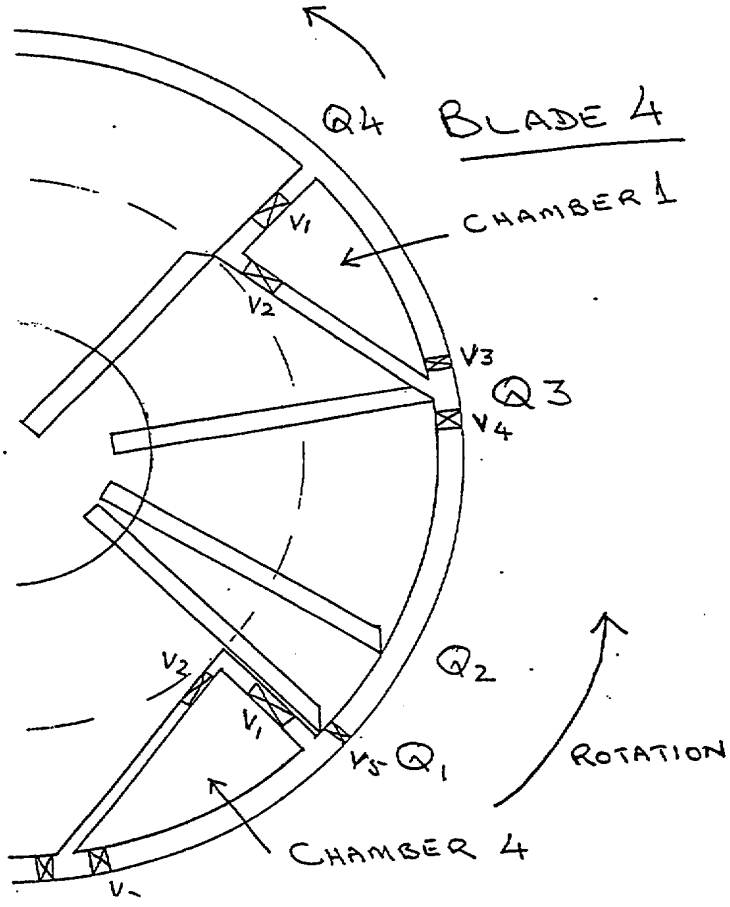
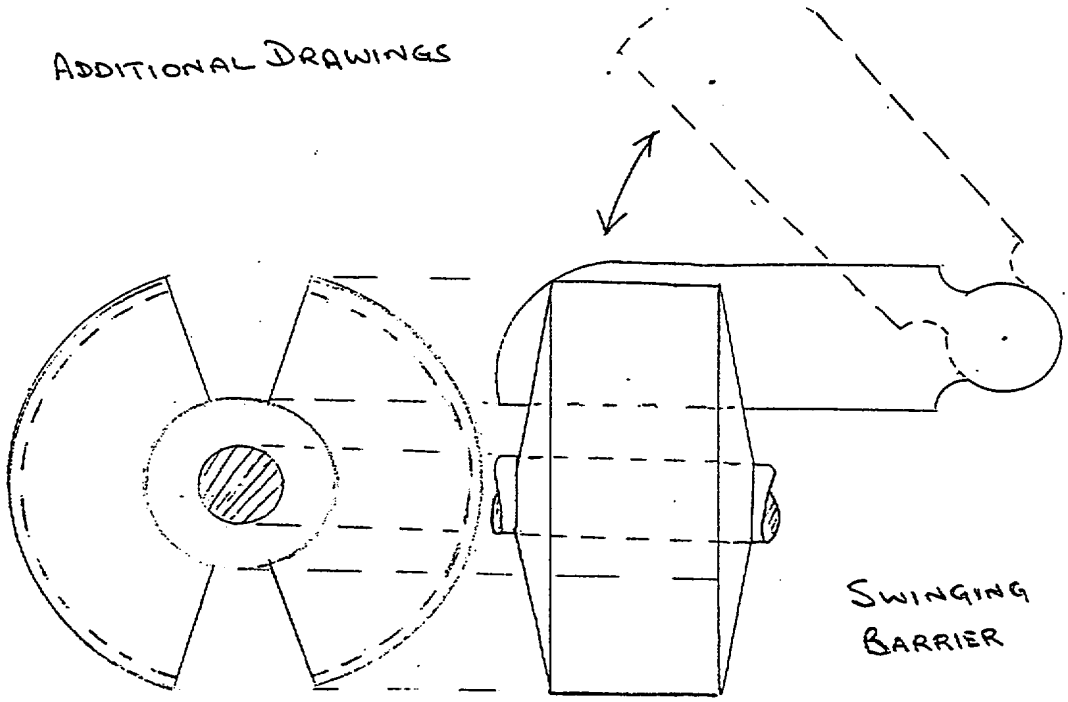


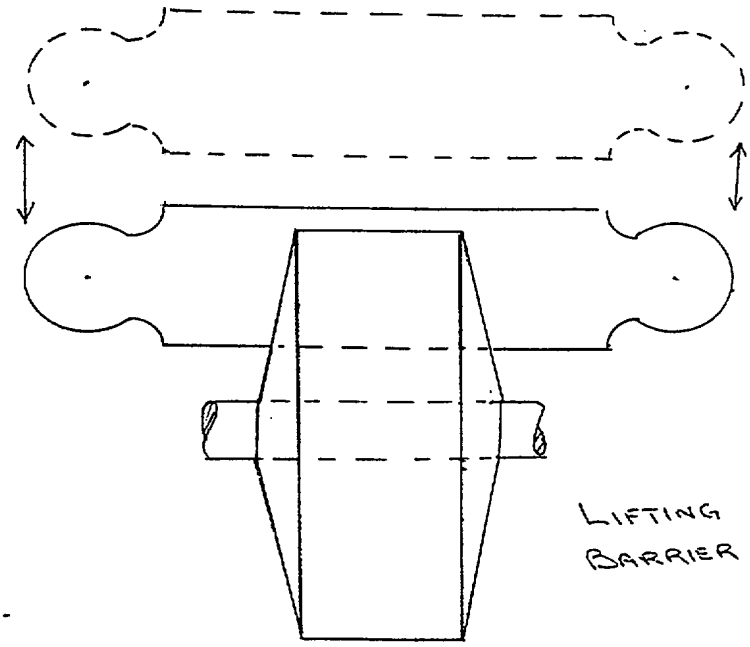

FIG. 5 B



ADDITIONAL DRAWINGS

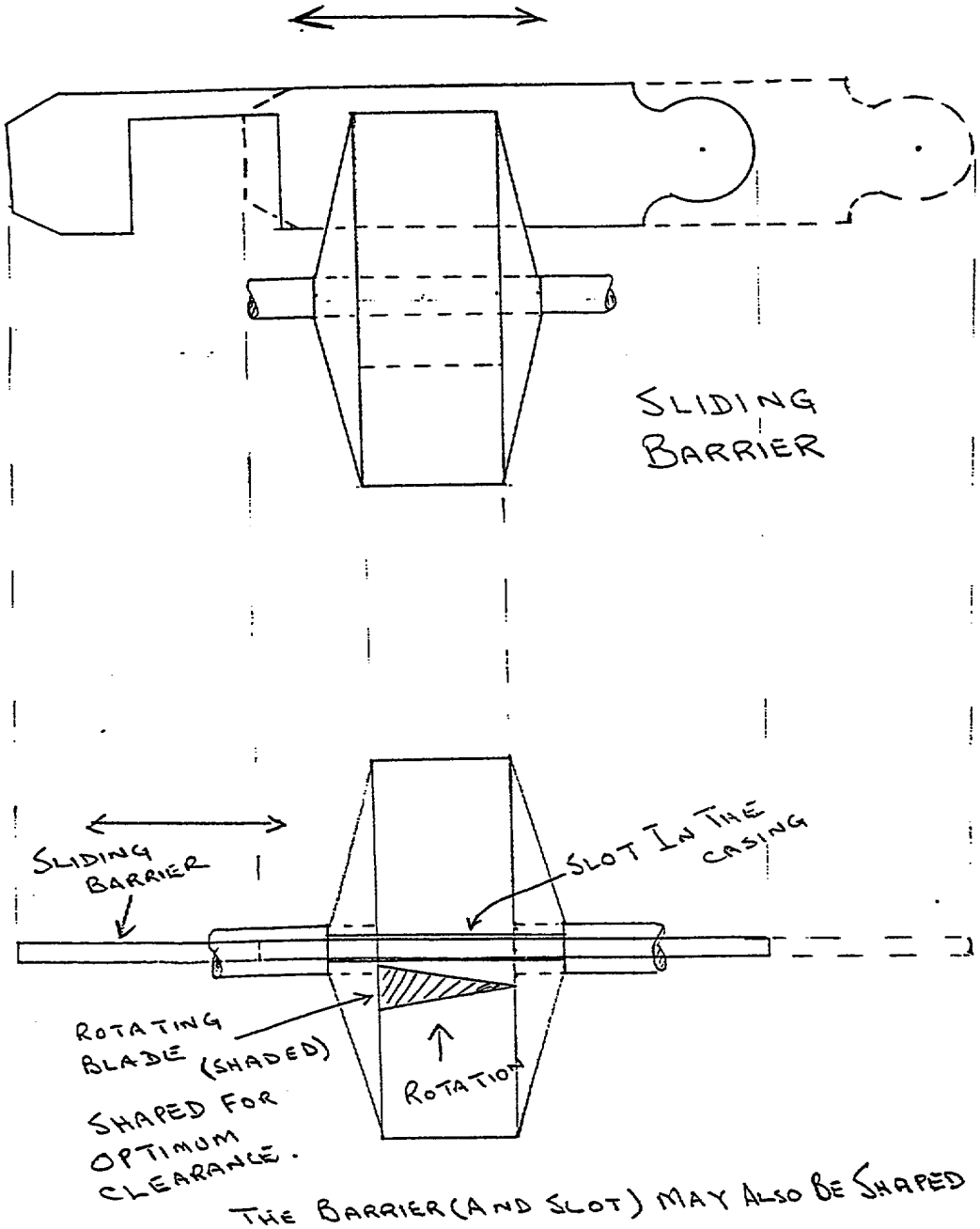


SWINGING BARRIER



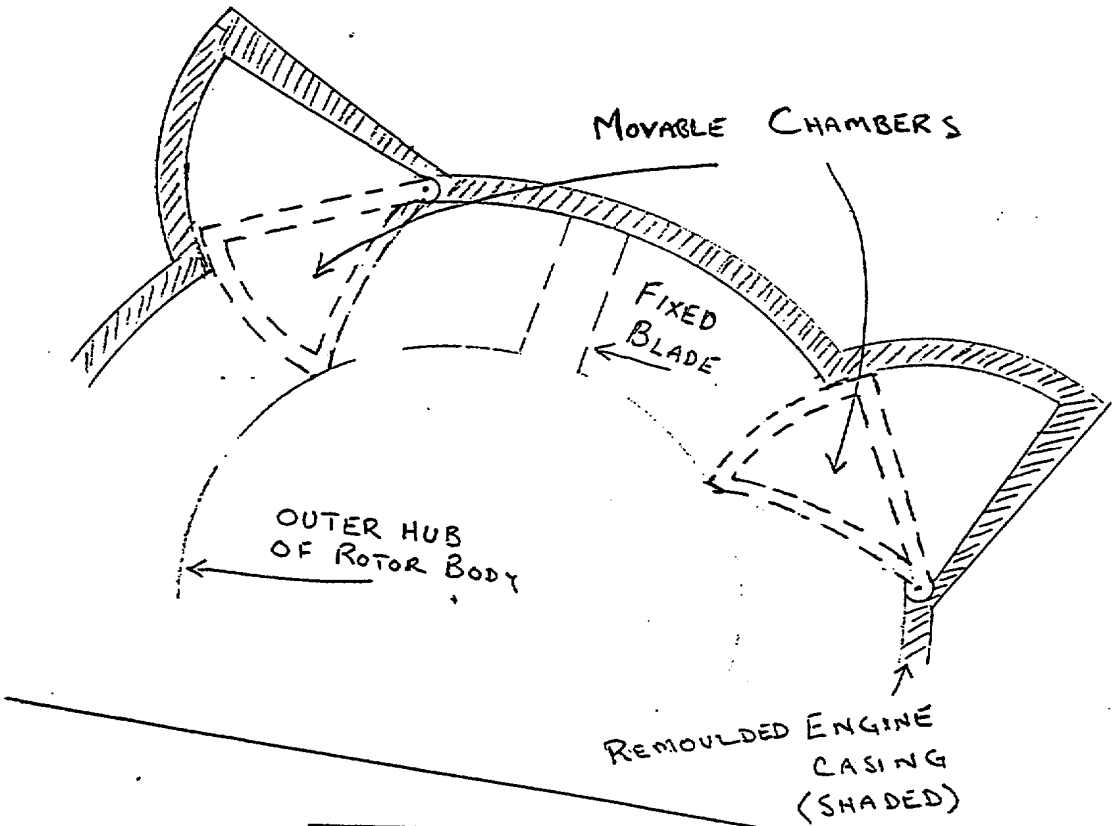
LIFTING BARRIER

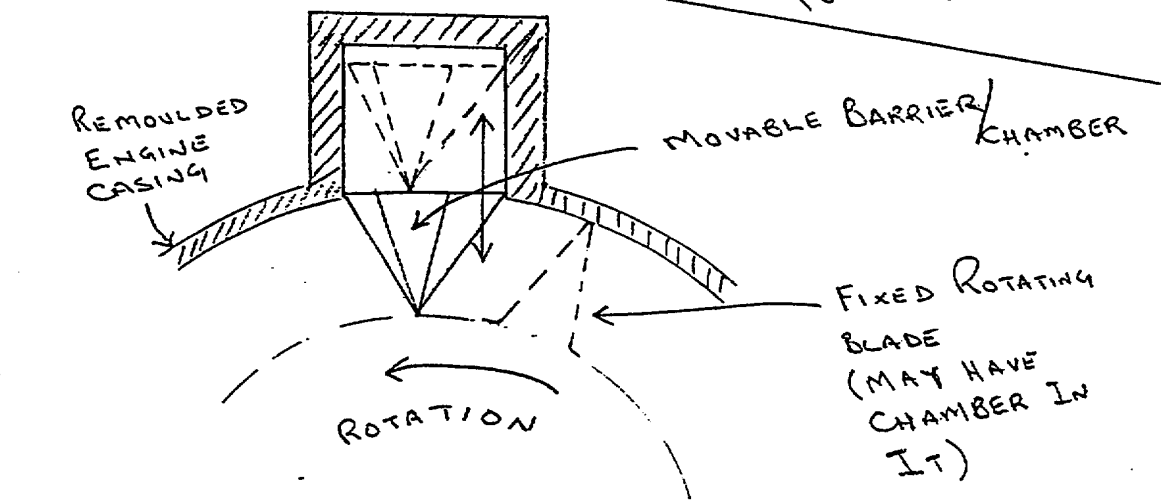
ADDITIONAL DRAWINGS




THE BARRIER (AND SLOT) MAY ALSO BE SHAPED

ADDITIONAL DRAWINGS



2356896

# INTERNAL COMBUSTION TURBINE

This invention is a new kind of internal combustion engine. The conventional internal combustion engine works by means of a piston moving in a reciprocating manner in a cylinder. This reciprocating movement is converted into circular motion by connecting the piston to a crankshaft. This type of engine and its basic principle is widespread and well known. However this engine has some shortfalls:

1) Some of the engine power is lost due to the reciprocating movement of piston, as its kinetic energy has to be zero at top dead center and bottom dead center.
2) Some energy is wasted due to the vibration caused by this reciprocating movement.
3) Some energy is wasted, as the piston is not always working at right angle to the crank.
4) Construction and precision of crankshaft and its attachments is an expensive process.

The invention mentioned here is designed to overcome these shortfalls.
Here I describe this invention by way of two examples.
Please note that in actual design or prototype, obvious changes can be made to overcome certain difficulties or to achieve certain results.

## DESCRIPTION EXAMPLE ONE

This example explains the working of engine without direct internal compression.

For drawings, please refer to the drawing pages immediately following this description.

Drawings page 1. Figure 1.

This is a straight shaft with circular cross-section except for some length in the middle where the cross-section is squared. This square cross-section is to receive a mounting and can be replaced by a hexagonal, triangular or other cross-section or maybe even a key and slot arrangement.

Drawings page 1. Figure 2.

A cylindrical hub to be mounted onto the shaft. It has two slots to receive blades. Actual number of blades and slots may vary. Please note the concave outer surface of this hub. Its use will be explained later.

Drawing page 1. Figure 3.

This is the blade to be mounted on the cylindrical hub described above. Please note the inverted 'U' ring shown above the blade. It will slide onto a groove cut into the outer surface of the blade and act in a similar way as the piston ring act on a piston.

Drawings page 1. Figure 1+2+3.

This figure shows the above-mentioned parts assembled together. This assembly makes the main rotating part of the engine, turning the shaft under power.

Drawing page 2. Figure 4a.

This figure shows the casing of the invented engine. Housed in this casing is the main rotating assembly described earlier.

Drawings page 2. Figure 4b.

This figure shows the cross-sectional view of the same casing. Shadowed and unshadowed sections are joined together to form the casing. Broken lines show the main rotating assembly. Please note the two slots in the casing along y – z where the two sections of the casing join. Again this arrangement is for example only. The actual construction of casing and number / shape of slots may differ.

Drawings page 2. Figure 4c.

This figure shows the facing surfaces of the sections of casing ( along line Y – Z in figure 4b. ) Please note the continuation of the curvature of the concave hub.

Also please note the 'U' ring slotted into one surface of one casing section and the bearing slotted into the facing surface of the other casing section. Same arrangements of 'U' ring and bearings exist in the lower slot but in reversed manner.

Use of these slots and ring / bearing arrangement will be described later.

Drawings page 3. Figure 5.

This is a specially designed, circular shaped, strong apertured plate. Two apertures are cut into its circumference in diametrically opposite direction. Width and depth of these apertures will be just big enough to let the rotating blades pass through. Please note the outer rings slotted into the circumference of this plate and tapered down towards the apertures W & X.

Also please note the angle $\theta$ subtended at the center of plate by the inner width of the aperture. This angle can be changed by changing the radius of the plate.

Drawings page 4. Figure 6 – upper and Figure 6 – lower.

In Figure 6 – upper, the engine casing is assembled with two strong apertured plates. One of them is only shown in part in broken line to save space. Similarly in Figure 6 – lower, the strong apertured plate is partly outlined to save space.

With these two Figures in conjunction, I explain the rotation of one blade through 180 degrees. The second blade will go through a similar process in the other half of the casing. Please note here that the shaft in the casing and the strong apertured plate are linked together so that they move in one complete circle in unison.

In the upper figure the strong apertured plate is positioned at the start of the cycle. At this point J one of the apertures is centered at the upper slot in the engine casing so that the rotating blade can pass through it. The lower Figure shows the position of this blade at this point (point J ).

As the blade rotates through an angle ½ $\theta$ to a point J the strong apertured plate will rotate through the same angle and will close the opening in the casing through which the rotating blade has just moved away. During this part of rotation fresh air is inlet into the casing.

At this point J the ½ $\theta$ segment of the casing ( between blade and the strong apertured plate ) is air tight because:

a) The 'U' ring of the blade is pressed against the inner side of the casing.
b) The 'U' ring of the casing, facing the strong apertured plate is pressed against it.
c) The outer ring of the strong apertured plate is pressed against the concave surface of the hub and against the continuation of this concave arc into the casing.

Back of the strong apertured plate runs over the bearings to minimize frictional losses.

At this point fuel is injected and ignited. This moves the blade, under power, to the point , which is ½ degrees short of the second slot in the casing. Here the exhaust port uncovers and exhaust gases are let out. As the blade reaches the second slot it passes through the aperture of the second plate, which is moving in unison with shaft as well.

In a two – bladed rotating device, the second blade goes simultaneously through the same process in the other half of the casing.

Drawing page 5. Figure 7.

The final shape of the engine will look similar to this figure, whereby the strong apertured plates, as well as the linkages are encased.

**Description example two**

This example explains the working of engine with compression-ignition cycle. Drawings relating to this description follow immediately after the description.

**Fig 1A (Drawing page 1)**

This figure shows the front view of the engine casing. Please note four compression chambers built into the casing. Fresh air is compressed into these chambers prior to ignition/explosion.

**Figure 1B (Drawing Page 1)**

This figure shows the side view of the same casing

**Figure 1C (Drawing Page 1)**

In this figure the front view of a segment of casing is enlarged to explain the location and function of various valves. Valves in one quadrant are explained here. Arrangement and location of valves will be same in all quadrants.

V1 - Explosion valve

This valve is located in the standing side of the compression chamber As ignition takes place in the chamber, it opens and lets the exploded gases out of chamber. turning the blades, the rotor assembly and the shaft under power.

V2 - Compression valve

This valve is located at the inner tip of the inclined side of the compression chamber. It opens when the fresh air is being compressed in the chamber.

V3 - Cleaner valve

This valve is located in the outer circumference of the casing that forms part of the compression chamber. It opens same time as the compression valve. But soon afterwards when incoming fresh air replaces the burnt out gases, it shuts, allowing the fresh air to be compressed.

V4 - Exhaust valve

This valve is located in the outer circumference of the engine casing,

close to the inclined side of the compression chamber, but out of it. It lets the burnt out gases to be exhausted out of the mid segment. ( The segment of engine casing between two compression chambers )

V5 - Breather valve

This valve is located in the engine casing close to the standing side of the ignition chamber, but out of it. It lets the fresh air into the mid segment. ( The segment between two chambers. )

--Please note that the diameters D1, D2, D3, and width W1 in these figures correspond to the D1, D2, D3, and W1 of figures 3, 4A and 4B.

--Also please note that the broken lined curve in figure 1C indicates the outer hub of the rotor body, which is compressed against the inner edge of the compression chamber, thus making the mid segment airtight. Rotor body is shown on drawing page 2, figure 2.

**Figure 2 (Drawing page 2)**

This shows the pictorial view of the rotor body. The hub has four slots cut into it. These slots will be just wide enough to receive blades into them. To make them completely air-tight, sealing rings can be arranged so that they press against the blades as well as against the engine casing. Inside of the hub there are arrangements to receive the main drive shaft of engine. This is shown in figure 4A.

**Figure 3 (Drawing page 2)**

This figure shows a rotor blade. It has a compression ring fitted onto its trailing face. Width of this ring, W1, corresponds to the W1 of figure 1B. So the blade, when moving inside the engine casing, forms airtight sections either side of it.

Outer edge of the blade has an inclined surface so that the leading face has smaller diameter than the trailing face. This inclined surface when comes in contact with the inclined side of the compression chamber, pushes the blade into its slot against the tension of springs. As soon as the blade passes over the inclined side of the chamber, it is pulled back out of hub-slot by the springs' tension. There will be four such blades, one into each slot.

**Figure 4A (Drawing page 3)**
This figure shows front view of the rotating assembly wherein the rotor body ( Fig 2 ) is fitted with the blades (Fig 3). Blade nos. 1 and 3 are shown fully extended out of their slots, whereas blades 2 and 4 are in the pushed back position.

**Figure 4B (Drawing page 3)**
This figure shows the side view of the same rotating body. Please note that the D1, D2, D3 and W1 in these figures correspond to D1, D2, D3 and W1 of figure 1A and 1B (Drawing page 1).
Figure 2 is repeated on this page for easy correlation.

**Figure 5A (Drawing page 4)**
This figure shows the rotation of blade no. 1 through 90″; from position P1 to P2 to P3 to P4.
At position P1 the blade's trailing face is facing the standing side of the compression chamber 1.
At this point ignition takes place in the chamber and its explosion valve V1 opens. The blade moves anticlockwise under power. Simultaneously the compression valve V2 and the cleaner valve V3 of chamber 2 open. The leading face of the blade pushes the fresh air of mid segment into chamber 2 through compression valve V2. The burnt out gases of chamber2 are driven out through cleaner valve V3.
At position P2 chamber2 is completely free of burnt out gases, its cleaner valve V3 closes. The fresh air in chamber2 starts to compress as the compression valve V2 remains open.
At position P3 the inclined surface of blade no.1 comes in contact with the inclined side of chamber2. Blade no.1 starts to be pushed back into the hub of the rotor body. compression of air continues till the blade no.1 reaches the compression valve V2. Then V2 shuts.
At position P4 as the blade passes beyond the inclined side of chamber2, it is pulled out to its extended position by the springs' tension, and the cycle repeats itself in the next quadrant.
Please note that the blade no.3 passes through the same cycle on the opposite side of the casing.

**Figure 5B (Drawing page 4)**
This figure shows the rotation of blade no.4 though 90", from position Q1 to Q2 to Q3 to Q4 at the same time as the blade no. 1 passes through positions P1, P2, P3, P4.
At position Q1 the breather Valve V5 and the exhaust Valve V4 open. As blade no.4 moves from Q1 to Q4, its leading face pushes the burnt out gases from the mid segment through exhaust valve V4. Simultaneously its trailing edge sucks in fresh air through breather valve V5.
As blade no4 passes beyond position Q4, the valves V4 and V5 shut, the blade is pulled out by the springs, and it goes through the same cycle in next segment.
Blade no.2 goes through the same cycle simultaneously in the opposite quadrant of the engine casing.

Please note that these are the bare basics of the idea. Obvious changes such as number, size, shape, location and arrangement for working of blades, chambers, sealing rings and valves can be made in working design of the engine.

--Please note that the idea is to to create a compression / ignition / compression-ignition chamber within the segment of engine which is swept by normal, or extended (as in example two) length of the blades. This chamber can be a temporary one as in example one. Wherein blades are fixed but the barrier (apertured plate as described there, or a guillotine plate or batwing windows etc. in its place) is removed temporarily to let the blades pass through.
Or this chamber can be a fixed part of the casing. In this case the blades may sweep at variable length, pitch, or angle as described in example two.
--Please note that other arrangements may be made to let the blades through/around/under the fixed chambers. For example the blades may be folded round the hub, or flipped about a vertical axis (as in changeable pitch propellers)
--Also please note that various combinations of arrangements of example one and example two are possible to achieve optimum results. For example, a barrier or engine casing next to it may be designed for use as a chamber or a chamber may be designed inside rotating blade itself.
--Another part of idea is to have blades moving in the casing such that they form an airtight contact with the casing.
--Another part of the idea is to have the barrier (or compression chamber, as in example two) firmly pressed against the hub. So that it forms an airtight compartment either side of it.

-- ONLY A FEW OF POSSIBLE ALTERNATIVES / MODIFICATIONS / COMBINATIONS ARE SHOWN IN "ADDITIONAL DRAWINGS" PAGES, WHICH FOLLOW.

## CLAIMS

1. An internal combustion engine, with or without compression, consisting of one or more rotating, shaft-mounted, blades where shaft is concentric with the engine casing and blades are in contact with the inner side of casing, similar to piston- cylinder contact in conventional reciprocating engine, forming air-tight segments in the casing so that the space swept by normal length of blades is used for compression or / and ignition-explosion, resulting in the generated power be applied direct to the blades, similar to power applied to piston in a reciprocating engine

2. An internal combustion engine as in Claim 1 where the engine casing has slots cut into it so that a barrier may be placed in / through these slots to create an ignition / compression chamber, within the casing or / and within the barrier or / and adjacent to casing, and / or within the blades. . Shape and size of slots will be designed to correspond to the shape, size and design of the barrier.

3. An internal combustion engine as in Claims 1 and 2 wherein the compression ring ('U' ring in figure 4c example 1) and bearing arrangement are provided onto the surfaces of the slots in the engine casing. So the barrier may move through the slot keeping the casing air-tight. Both the Bearings **AND** the 'U' ring can be mounted on **EACH** surface of the slot. This means **EACH** surface may provide air-tightness and smoother run simultaneously.

4. An internal combustion engine as in Claim 1 and 2 wherein a circular apertured plate rotating through the slot is used to create an air-tight chamber.

5. An internal combustion engine as in Claim 1, 2, 3 and 4 wherein a cylindrical hub with concave outer surface is mounted onto shaft so that the rotating apertured plate may run over the concave surface to form an air-tight chamber. Apertured plate may have a chamber inside it.

6. An internal combustion engine as in Claims 1,2,3,4 and 5 wherein the curvature of the hub is continued onto the casing so that the apertured plate continues to run over this curvature maintaining the air-rightness of the chamber.

7. An internal combustion engine as in Claim 1, 2 and 3 wherein a hinged movable barrier is placed in the slot of engine casing. This barrier may be made to accommodate a chamber inside it. The barrier swings out of the path of rotating blades. The chamber may be used for compression-ignition. The barrier may be shaped so that the optimum clearance from rotating blade is achieved.

8. An internal combustion engine as in Claim 1, 2 and 3 wherein a liftable barrier is placed in the slot of the engine casing. This barrier may be designed to accommodate a chamber inside it. The barrier will be momentarily lifted out of the path of the rotating blades. The barrier may be shaped so that the optimum clearance from rotating blade is achieved.

9. An internal combustion engine as in Claims 1, 2 and 3 wherein a sliding apertured barrier is placed in the slot of engine casing. This barrier may be designed to accommodate a chamber inside it. The barrier will slide sideways to allow the rotating blades pass through the .aperture. The barrier may be shaped so that the optimum clearance from rotating blade is achieved.

10. An internal combustion engine as in Claims 1 and 2 wherein rotating drive shaft is linked to the movement of the barrier in a way that the blades move unhindered by the barrier while the air-tight chambers are created systematically for generation and application of power.

11. An internal combustion engine as in Claim 1 wherein specifically designed chambers are built into the engine casing. Number of chambers will depend upon the particular engine requirements, so will be the shape, size and arrangement of compression / explosion / exhaust valves. The casing is concentric with the drive shaft. Chambers exist within the volume of segment swept by the normal length of rotating blades. Chambers are firmly pressed against the central hub of the engine so that the segments of casing either side of a chamber are air-tightly separated.

12. An internal combustion engine as in Claim 1 and 11 wherein a specifically designed hub is used to drive the shaft. The shaft is located in the centre of this hub. Slots are cut into this hub to receive blades into them in such a manner that the blades can slide in and out through these slots. Sealing rings are arranged in these slots so that the blades form an air-tight contact with the hub, also that the hub forms an air-tight contact with the casing.

13. An internal combustion engine as in Claims 1 and 11 wherein the blades, rotating concentric with the casing move in and then out of the hub as they run over and then beyond the chambers.

14. An internal combustion engine as in Claims 1 and 11 wherein the circular engine casing is remoulded at designed locations so that the moveable chambers may be accommodated into this remoulded shape when it moves out of the path of fixed rotating blades. In this case the blades may be a rigid part of the hub like that of an ordinary propeller.

15. An internal combustion engine as in Claims 1, 2, 11 wherein the rotating blades are designed to accommodate chambers and related valves inside them.

16. An internal combustion engine substantially as described herein with reference to accompanying drawings, and where various combinations of concepts of examples 1 & 2 are possible.

**Application No:** GB 0027605.5
**Claims searched:** 1-15

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**Date of search:** 9 February 2001

# Patents Act 1977
# Search Report under Section 17

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.S): F1F FD FEV FEW FEY

Int Cl (Ed.7): F01C 21/08, 10

Other: Online:WPI,EPODOC,JAPIO

**Documents considered to be relevant:**

| Category | Identity of document and relevant passage | | Relevant to claims |
|---|---|---|---|
| X | GB 2254888 A | (Giles) see Figures 11-14 | 1, 10 |
| X | GB 2104154 A | (Sebastiano) see Figures 1-7 | 1, 2, 4, 10 |
| X | GB 1564102 | (Ronaldson) see whole document | 1, 12, 13 |
| X | GB 1524882 | (Herstal) see whole document | 1, 7 |
| X | WO 98/06933 A1 | (Quincoces) see whole document | 1, 10 |
| X | US 4683852 | (Kypreos-Pantazis) see e.g.col.4 lines 1-21 | 1, 8 |

| | | | |
|---|---|---|---|
| X | Document indicating lack of novelty or inventive step | A | Document indicating technological background and/or state of the art. |
| Y | Document indicating lack of inventive step if combined with one or more other documents of same category. | P | Document published on or after the declared priority date but before the filing date of this invention. |
| & | Member of the same patent family | E | Patent document published on or after, but with priority date earlier than, the filing date of this application. |

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**INVENTOR-INFORMATION:**

| NAME | COUNTRY |
|---|---|
| KHALID, MUHAMMAD YOUSUF | GB |

**ASSIGNEE-INFORMATION:**

| NAME | COUNTRY |
|---|---|
| KHALID MUHAMMAD YOUSUF | GB |

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